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ABSTRACT

The purpose of this paper is to examine arrow design in relation to the type of pointing, connecting, or processing involved. Three possible approaches to the investigation of arrows as graphic communication include research: by arrow function, relating message structure to arrow design, and linking user expectations to arrow design. The following functions emerge following a subjective survey of existing arrows: identify (one-point functions); connect or link (two-point functions), and direct (imperatives directing action and describing processes). Content, context and style are message-related variables that arrow design should serve to interpret. Research design must consider reader expectations of arrow types. Three categories of arrow rules exist: (1) technical rules governing arrow usage appear in such fields as mechanical engineering, traffic management and international signage; (2) formal rules in disciplines where arrows serve in flow charts and mind mapping activities; and (3) informal rules in general sign situations, cartooning, and other areas. Nine figures present examples of various arrow types; an arrow clarity survey form is also provided. (AEF)

Arrows: A Special Case Of Graphic Communication

by Pris Hardin

Graphic arrows dart through our lives, labeling, directing, describing paths and processes. They serve many roles from linking labels to machine parts in technical drawings, to connecting elements of flow charts to directing traffic in defense of life and limb.

Like numerous elements in our lexicon of graphic icons, our unquestioning acceptance of the meanings of arrows deserves investigation. What makes an effective arrow? Are there "good" and "bad" arrows? Is the preference for one arrow design over another a matter of personal whim or a part of a larger graphic language that we learn to interpret? These questions prompt a call for investigation of arrow design in relation to the type of pointing, connecting or processing involved.

In Search of Meaning

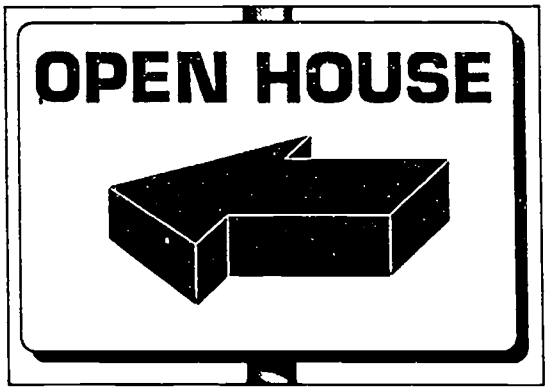
Several observations lead one to suspect that arrows represent a special case of symbolic meaning. Examples of arrows that seem awkward, confusing or "wrong" are easy to find. Figure 1 shows a roadside sign displaying an arrow that could be construed as pointing in two directions at once—especially by a motorist passing at highway speed. Figure 2 depicts a mass-produced arrow intended by a nationwide real estate company to direct buyers to a nearby open house. From a distance, drivers may see a random polygon rather than a clearly defined arrow shape. In this instance, the arrow looks like one offered to users in a popular computer software application. That we can identify arrows that seem to

Figure 1

CONTRARY FEATHER ON NURSERY ARROW

Figure 2

RANDOM POLYGON ARROW



violate some intuitively-held rule suggests that rules for arrows do exist.

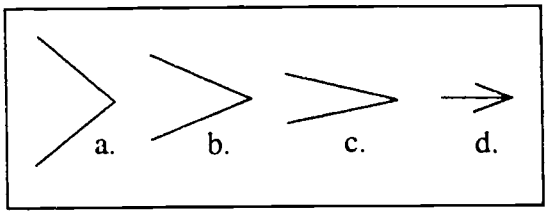
Another observation suggests that we hold in our minds some rules for defining arrows—we seem to quickly and skillfully differentiate between forms intended as arrows and forms similar to arrows. The triangular shapes surrounding the head of the cartoon figure in Figure 3 are identical in form to arrows used in numerous drawings. Yet we readily identify them as carrying a different, non-

Figure 3
ARROW HEAD SHAPES WITH NON-ARROW MEANING

pointing meaning. We also interpret certain equilateral triangles as arrows, like the forward and rewind controls of recording machines, while we easily identify other equilateral triangles as site markers on maps or traffic warning signs.

A third observation suggests that arrow meanings may vary with variations in arrow shape. Adrian Frutiger (1989) states, with a ring of authority, that the arrow heads in Figure 4 connote greater force or movement as the angle of the arrow head becomes more acute (toward the right side of the figure).

Figure 4
ANGLE OF ARROW HEADS
From Frutiger, 1989

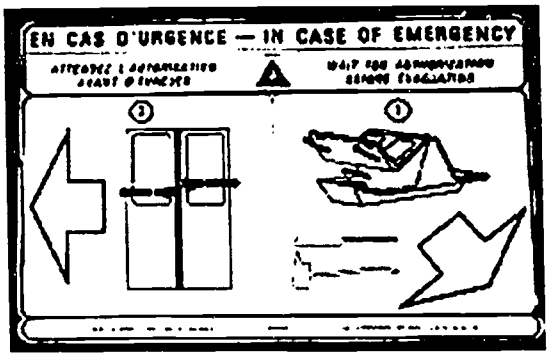


The expression of the angle sign as a direction pointer alters considerably with the degree of the angle. One that is greater than 45° is seen rather as a resistance against an oncoming force, such as a dam (a). A 45° angle sign is recognized as a moving sign, but only with slow and difficult movement, like a snow plough (b). At about 30° the angle sign can be compared to an earth plough (c). Only from about 20° downward does the angle sign become an arrow (d). The inner area is small and less visible; the sharp point produces a reaction of danger, against which viewers must protect themselves. The angle sign has become a weapon.

Frutiger, p 48
Signs and Symbols

No reference to investigative authority accompanies Frutiger's assertions. Are these assertions true for most viewers of arrows? Under what conditions are these assertions true? Perhaps Frutiger's certainty is true with his native German culture. Are there exceptions? Figure 5, a sign posted inside the cars of the metro system in Montreal, Canada,

Figure 5
METRO EMERGENCY ESCAPE ARROWS—Montreal, Canada



shows two arrows of the type Frutiger claims represent "resistance." In Montreal, this arrow shows riders the path of *least* resistance to an emergency exit.

The confidence with which Frutiger presents his ideas serves to make the point that some authority other than personal opinion would be helpful to guide arrow users who intend to make the most effective communication. Probably the most valuable interpretation of Frutiger's statement is that there is a need for research.

Before proceeding to outline factors that researchers should consider in designing any investigative process, a basic set of terms would be useful to facilitate discussion of arrows. Figure 6 suggests a graphic lexicon.

Approaches to Investigation

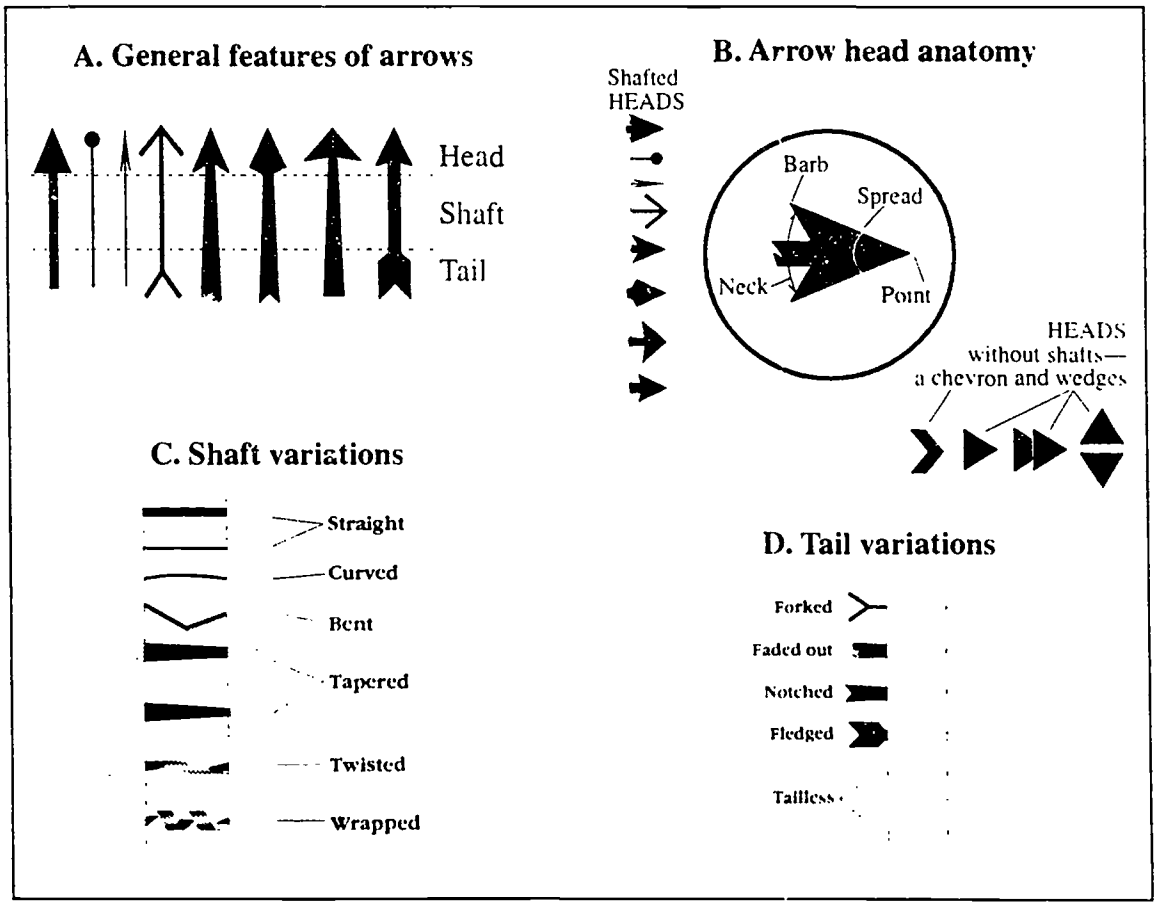
Three possible approaches to investigations of arrows as graphic communication follow:

- research by arrow function
- research relating message structure to arrow design
- research linking user expectations to arrow design.

Arrow Function

Studies of arrow function might reveal relationships between arrow design and arrow function. Four functions emerge following a subjective survey of existing arrows: IDENTIFY (one-point functions), CONNECT or LINK (two-point functions), DIRECT (imperatives directing action and describing processes).

Figure 6
PROPOSED NOMENCLATURE FOR ARROWS RESEARCH



Identifiers

These one-point-function arrows serve as pointers to precise locations on charts and graphs, diagrams, and drawings. From you-are-here pointers on orientation maps to arrows labeling items in mechanical drawings, identifiers perform the most simple functions of all arrows.

Connectors

These two-point-arrows link elements together. They may be two headed as some arrows in sociograms, flow charts and mind maps.

Directors

These arrows are the imperatives of arrow communication. They map action—directed at the viewer or describing a flow of elements and processes like the way-finding arrows directing participants through a maze or the great, spiraling arrows that teach the turbulent climb of hot air in a tornado. Director arrows represent action in a static graphic format.

Message Structure

Content, context and style are message-related variables that arrow design should serve to interpret. Variations in one or all of the arrow components represented in Figure 6 may serve to convey meanings related to content and context.

Arrow content or basic directional message are presumably reflected in the arrow form and orientation. However, there are cases where arrow design becomes virtual obfuscation to the reader. Some technical drawings utilize arrow heads of such tiny and narrow design that only trained workers find their way easily through the content of the blueprint. By the same token, the arrow in Figure 1 may actually be interpreted as pointing in the opposite direction from the nursery owner's business.

Arrow context also influences arrow design. If placed within a drawing or photo of densely packed images and colors, some arrows of relatively simple and clear design may become lost in the busy environment. Designers of arrows that must communicate in busy environments should develop a lexicon of graphic devices for assuring good visibility. Research of arrows and message structure must control for variations in arrow context.

No consideration of arrow design would be complete without giving attention to the descriptive potential of arrow style to interpret content and context. In addition to the function of pointing, arrow design may describe degrees of urgency, authority, speed, power and a rich range of other amplifications of the basic direction indicated. These characteristics are the "adverbs and adjectives" of arrow design. These variables must be accounted for in any study of arrow design and message structure.

The arrow in Figure 7 represents an example of possible stylistic misuse of the dotted line shaft. Intended to firmly and clearly direct buyers to the family fruit stand, the dotted line seems less forceful than the situation warrants. The style of rendering—informal, dry-brush—also contributes to a less precise message.

Figure 7
HOME-MADE SIGN FOR FRUITSTAND

Roles of arrows

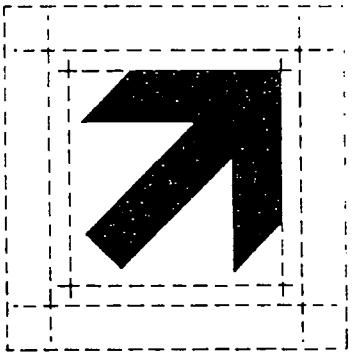
A third variable with bearing on investigations of arrow design has to do with the viewer's expectations of arrow form and function. Research design must consider reader expectations of arrow types whether they follow paradigms as technically defined as engineering or architecture arrows or as popularly defined as those in comic strips and cartoons.

The writings of Edward Hall offer a framework for categorizing culturally held norms. Hall develops a continuum of three categories: technical, formal and informal. This continuum assumes ranges of rules from the analytically codified, written ones (technical) through unwritten but verbally describable rules (formal) to rules so intuitively held that few can articulate the rules and violations prompt involuntary reactions of dismay, laughter or anger (informal). With a bit of license, these criteria may apply to the business of accounting for viewer expectations of arrow design.

All three categories of arrow rules appear to exist. *Technical rules* governing arrow usage appear in fields such as mechanical engineering, traffic management and international signage. In these arenas, published documents specify the dimensions and style of rendering for each category of arrow usage (American Institute of Graphic Arts 1979, Dreyfus 1972, Pennsylvania Dept. of Highways 1955, Polon 1967). Figure 8 offers some examples.

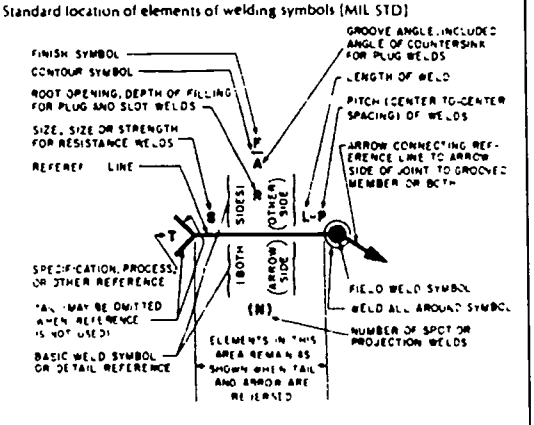
Formal rules obtain in disciplines where arrows serve in flow charts and mind mapping activities. The American Institute of Graphic Arts (AIGA) (1974, 1979) documents many icons that fall into this category. The AIGA publications present numerous examples of each graphic icon followed by general commendation of several outstanding images

Figure 8
EXAMPLES OF TECHNICAL ARROWS



AIGA 1979

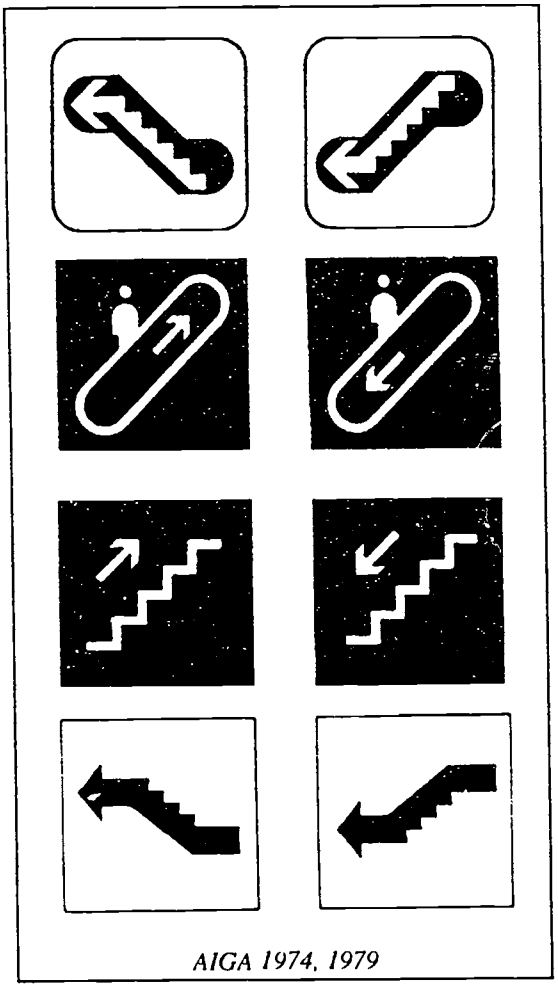
Pennsylvania Dept. of Highways 1955



Polon 1967

(Figure 9). Designers are urged to employ *similar* graphic devices; no technical requirements appear to be in place.

Figure 9
EXAMPLES OF FORMAL ARROWS



AIGA 1974, 1979

Informal rules, if they can be shown to exist (Hardin 1982), obtain in general signage situations, cartooning and other areas where arrows serve (see Figures 1, 2 and 3). Carl G. Liungman's *Dictionary of Symbols* represents an ambitious effort to identify ancient and historic icons, including arrows, and seek out their derivations.

An Intitial Proposal

Since a brief search of the literature failed to produce model research procedures for investigating arrow efficacy, I submit one possible preliminary strategy for consideration.

By presenting verbal descriptions of situations that call for arrows, respondents could select their preferred style of arrow appropriate to the need from sample clusters of arrows. Early casual exploration of this strategy might involve very brief descriptions of the arrow needs and settings as presented in Figure 10.

If preliminary evidence warrants further inquiry, more carefully structured investigations should be designed. At that point, descriptions of arrow-dependent situations should be designed to incorporate variables covering all of the factors laid out in this paper: arrow function, message structure and reader expectations or roles.

Conclusion

Full benefit would derive from a variety of research strategies and designs that pursue reader expectations across cultures as well within disciplinary paradigms. Studies that *elicit* arrows from participants would target most directly the question of informal norms. Computer-based data gathering might circumvent the problem of codifying clumsily drawn handmade arrows.

A research-based body of knowledge could emerge that would inform arrow selection by designers, technicians, computer programmers and, ultimately, by general publics.

Figure 18
PROPOSED SURVEY INSTRUMENT FOR INITIAL INQUIRY

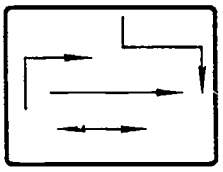
Arrow Clarity Survey

Return completed form to Pris Hardin

This survey calls for matching each written description below with one of the boxes of arrows.

For each of the situations described in text, choose the type of arrows that you believe would most clearly communicate the movement or direction of labeling required. You may use any category of arrows as many times as you want. You are not required to use all of the categories shown to complete the survey.

Note: Don't expect to find a specific arrow in a box that exactly describes the connection you have in mind; rather each box of arrows is meant to represent a style of arrow that you would follow in crafting the contour, size and length of the arrow or arrows you would need to do the job.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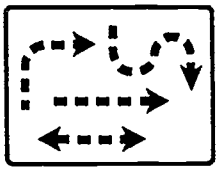
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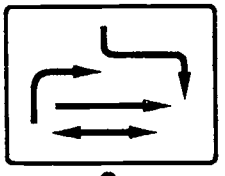
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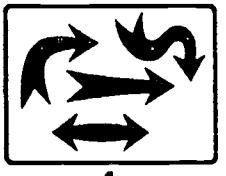
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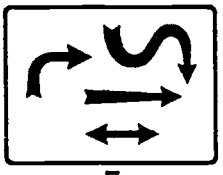
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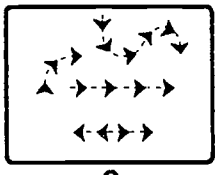
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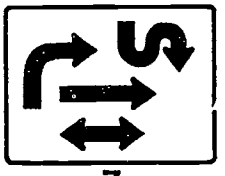
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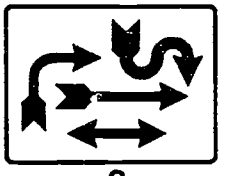
8.

Write # of selected arrows box below.

____ Choose a category of arrow for a sign in a hallway directing parents to the school office around the corner.

____ Choose an arrow type to show on a drawing where the trackers worked their way through the underbrush and around the fallen tree to get back to the trail.

____ Which arrow type would you use in a drawing to describe the back and forth action of a new shredder appliance.

____ Choose a category of arrow for use in a mechanical drawing to connect a widget with its proper location in the engine layout.

____ Which arrow category would you pick for a drawing that shows the path followed by a steel ball as it rolls down a winding chute?

____ Choose an arrow type for a sign guiding drivers off of a freeway and under a bridge to a park.

Write # of selected arrows box below.

____ Choose a type of arrow to use in an ad describing the upper body action promoted by a rowing machine.

____ What type of arrow style would you choose to mark the path of a local fun run on the city map?

____ Choose a category of arrow for use on a blueprint showing plans for constructing a backyard doghouse.

____ Which arrow category would you use on the "road signs" for a preschool's tricycle safe driving course?

____ Choose an arrow category with which to describe the squeezing action of a team of cowboys as they herd cows toward a corral gate.

____ Which arrow category would you use on a map to show how wind currents on a lake move floating surface debris away from the dam.

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